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Yellowtail flounder, redfish (*Sebastes spp*) and witch flounder indices from the Spanish Survey conducted in Divisions 3NO of the NAFO Regulatory Area

by

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Abstract

Since 1995, Spain carries out a spring stratified random bottom trawl survey in Div. 3NO of the NAFO Regulatory Area. Total mean catches, biomass and mean numbers for yellowtail flounder (*Limanda ferruginea*) are presented for the period 1995-2013, for redfish (*Sebastes spp*) for the period 1997-2013 and for witch flounder (*Glyptocephalus cynoglossus*) for the period 2002-2013. Detailed indices are presented from 2009. Yellowtail flounder does not show a clear trend since 1998; its indices are almost constant throughout this period, with a slight increase in the last five years. Redfish indices oscillate greatly over time, probably because the gear does not sample adequately aggregating pelagic species. There was a sharp increase in 2009, being more or less stable since then at a high level, comprising the 3N around the 90% of the total biomass in last years. Good year classes have not been registered recently. Witch flounder is very scarce and also lacks a clear trend in the data series, being the values always poor. Recruitment was quite good at the beginning of the series but very poor in recent years.

Material and methods

The Spanish Spring (May/June) survey in Div. 3NO of NAFO Regulatory Area was initiated by Spain in 1995. Until 2001, the survey was carried out on board the Spanish vessel C/V *Playa de Menduña* (338 GT and 800 HP) using a *Pedreira* type bottom trawl. The R/V *Vizconde de Eza* replaced the C/V *Playa de Menduña* in 2001, and the *Campelen* 1800 was implemented as survey gear. The main specifications and geometry of these gears, their rigging profile and the

net plan, and the survey technical information are described in Walsh *et al.* (2001). The survey area was stratified following the standard stratification schemes (Bishop, 1994). Set number was allocated to strata proportionally to their size, with a minimum of two planned hauls per stratum and trawl positions were chosen at random (Doubleday, 1981). Biomass indices were calculated by the swept area method (Cochran, 1997), assuming catchability factor of 1. Table 1 presents the number of valid tows, the depth strata covered and the dates of the total survey series. Table 2 shows the swept area and number of hauls by stratum for the last five years (2009-2013). To know the results of the rest of the years, see González-Troncoso *et al.*, 2013. More information on the calibration method can be found in González Troncoso *et al.* (2004) and Paz *et al.* (2004).

The catch from each haul was sorted by species and weighted. Random samples of the catch of each species were length measured (total length) to the nearest lower cm. The obtained length distribution was aggregated into 2 cm intervals (beginning with the pair number) and raised to the catch of each species.

The redfish series for total biomass and total mean catches and mean number per tow start in 1997 because sampling depth in 1995 and 1996 was shallower than 1000 meters so the data are not representative for this species. As the strata where the yellowtail flounder is presented were well surveyed, the series for this species are presented since 1995. The witch flounder dataset used in this paper starts in 2002 because data collected with the first vessel in the earlier years have not been calibrated yet. The data for yellowtail flounder and redfish are calibrated for the period 1995-2000 and no-transformed from 2002 onwards. Regarding 2001, there are both calibrated (from the former vessel) and non-transformed data (from the new vessel).

Mean catch and variance per haul, biomass and length distribution by strata are presented for each species for the last five years (2009-2013). To see the results of the rest of the years, see González-Troncoso *et al.*, 2013. Total biomass and mean catch per tow with SD and mean number per tow by year are presented for the total period series.

Figure 1 presents the maps with the distribution of the catches of the three species during the 2013 Spanish 3NO survey.

Results

Yellowtail flounder

After a moratorium between 1994 and 1997, the yellowtail flounder fishery is under TAC. According to the Report of NAFO Scientific Council Meeting, stock size reached a minimum in the mid 1990's, but since 1994 has steadily increased and is now well above B_{msy} . There is very low risk of the stock being below B_{msy} or F being above F_{msy} . Recent recruitment appears about average (NAFO, 2013).

Mean Catches and Biomass

Table 3 shows mean catch and SD per haul and stratum and Table 4 the biomass estimates by the swept area method and their SD by stratum for years 2009-2013 for yellowtail flounder. Total biomass (t) and stratified mean catch per tow (kg) and SD by year for the entire series are presented in Table 5. Table 6 presents the parameters a and b for the calculation of the length-weight relationship for years 2009-2013

Yellowtail flounder indices show no clear trend throughout the study period. There was an increase between 1995 and 1999 but since 2001 the indices stabilised at a higher level, with a slight increase in the last five years (Figures 2 and 3).

Length Distribution

The mean number per haul by year is presented in Table 7 and Figure 2 for 1995-2013 and Table 8 presents the same index by length, sex and year besides the sampled size and catch for the period 2009-2013. Figures 4 and 5 present these indices for the entire period. The mean numbers are in concordance with the mean catch (Figure 2). There has not been good recruitment in recent years. In Figure 4, we can follow a length modal value since the beginning of the series, but the presence of juveniles is very low. This mode can be seen until 2009, year in which reaches the 34-35 cm, and since 2010 the mode of the length distribution was about 30-34 cm. In 2012 and 2013 the mode for the females was at 34 cm and for males 30 cm.

Redfish

There are two species of redfish that have been commercially fished in Div. 3NO; the deep-sea redfish (*Sebastes mentella*) and the Acadian redfish (*Sebastes fasciatus*). They are very difficult to distinguish, and consequently they are collectively reported as "redfish" in the commercial fishery statistics. This stock in Div. 3O has been under TAC regulation since 1974. In September 2004, the Fisheries Commission adopted an annual TAC of 20 000 t in the entire area of Div. 3O. The stock appears to have increased since the early 2000s. Current fishing mortality appears low and recent recruitment is unknown. In 3N (the stock is 3LN) there was a moratorium from 1998-2009, but the fishery reopened in 2010 and the increase of the catch with the reopening has not altered the perception of the stock given by the available surveys (NAFO, 2013).

Mean Catches and Biomass

Redfish mean catches and SD are presented in Table 9 and biomass in Table 10 by stratum for 2009-2013. Annual biomass and stratified mean catch and SD per haul for years 1997-2013 are presented in Table 11 by Division. The length-weight relationship parameters a and b are presented in Table 12 for years 2009-2013.

Redfish indices show a quick increase from 1997 to 2000, followed by a sudden drop until 2002, after which they have increased to the levels of the early years of the time series. The index increased nearly fivefold in 2009 in comparison with 2005, the second higher value of the series

(Figures 6 and 7). This was not just due to very large catches in few hauls, as redfish catch was over 1 ton in 11 of the 43 hauls in which redfish was caught. Furthermore, redfish catch was over 15 tons in three hauls. Since 2010 a decreasing trend can be seen in the figures, but the indices for these years are still the highest of the series.

Biomass and mean catch per haul and Division, the number of strata covered in each case, and the percentage of biomass in 3N respect to the total are presented in Table 11. Biomass is always larger in 3N than in 3O (Figure 8), although the percentage is very spread over the time. Since 2005, more than 83% of redfish catches have occurred in Division 3N. However, the mean catch per tow is usually higher in Division 3O. In 2010, mean catch per tow in 3O was almost four times higher than in 2009, whereas in 3N was lower than in 2009. In 2013 the increase in the total biomass seems to be due the increase in Division 3N.

Length Distribution

Mean number per haul by year is presented in Table 13 and Figure 6 for 1997-2013. Table 14 presents this index per length with sample size and catch for the period 2009-2013. Figures 9 and 10 show the trend of the mean abundance per tow. The y-axis upper limit of Figure 10 was changed for years 1997-2008 to see the length distribution despite the large catches registered in the period 2009-2013. The last good year class was recorded in 2004 and this cohort can be tracked until 2013. In recent years there is only a discrete presence of juveniles. The clear 18 cm mode (20 cm in 2011) in 2009 seems to be a consequence of the 2004 recruitment. In 2012 and 2013 the mode is in 20 cm.

Witch flounder

This stock occurs mainly in Div. 3O, along the southwestern slopes of the Grand Bank, but it seems to migrate seasonally onto the shallow banks. It has been fished mainly in winter and springtime, targeting the spawning concentrations. Survey mean weights per tow in the Canadian spring series indicate no clear trend since 1990 and the stock remains at a low level compared with the 1980s although improving slightly in the last years. Recruitment (fish less than 20 cm) has been poor since 2002. This stock remains at low level, and no directed fishing on this species was recommended by the Scientific Council (NAFO, 2013).

Mean Catches and Biomass

Witch flounder mean catches and SD by stratum are presented in Table 15 and biomass per stratum in Table 16 for 2009-2013. In Table 17 and Figures 11 and 12 the annual stratified mean catch per tow and biomass with SD are presented for the period 2002-2013. The length-weight relationship parameters a and b are presented in Table 18.

Witch flounder indices show no clear trend throughout the period 2002-2013 (Figures 11 and 12). Always through poor values, the index peaked in 2004, and reached very similar values in 2010 and 2003. However, biomass declined again since then.

Length Distribution

Table 19 and Figure 13 present witch flounder mean number per tow and sex by year for 2002-2013, and Table 20 the same index by length with sample size and catch for the period 2009-2013. Figure 14 shows the trend of mean number per tow throughout the years. The best recruitment events occurred in the period 2002-2005 and have been very poor since 2008. Some modes can be tracked in Figure 13, probably due to the recruitments at the beginning of the series. In 2012 and 2013 there was a quite good presence of individuals of lengths 34-42 cm.

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Table 1.- Spanish spring bottom trawl surveys in NAFO Div. 3NO: 1995-2013.

Year	Vessel	Valid tows	Depth strata covered (m)	Dates
1995	<i>C/V Playa de Mendiña</i>	77	42-684	May 18-May 29
1996	<i>C/V Playa de Mendiña</i>	112	41-1135	May 07-May 24
1997	<i>C/V Playa de Mendiña</i>	128	42-1263	April 26-May 18
1998	<i>C/V Playa de Mendiña</i>	124	42-1390	May 06-May 26
1999	<i>C/V Playa de Mendiña</i>	114	41-1381	May 07-May 26
2000	<i>C/V Playa de Mendiña</i>	118	42-1401	May 07-May 28
2001 ^(*)	<i>R/V Vizconde de Eza</i>	83	36-1156	May 03-May 24
	<i>C/V Playa de Mendiña</i>	121	40-1500	May 05-May 23
2002	<i>R/V Vizconde de Eza</i>	125	38-1540	April 29-May 19
2003	<i>R/V Vizconde de Eza</i>	118	38-1666	May 11-June 02
2004	<i>R/V Vizconde de Eza</i>	120	43-1539	June 06-June 24
2005	<i>R/V Vizconde de Eza</i>	119	47-1485	June 10-June 29
2005	<i>R/V Vizconde de Eza</i>	119	47-1485	June 10-June 29
2006	<i>R/V Vizconde de Eza</i>	120	45-1480	June 7-June 27
2007	<i>R/V Vizconde de Eza</i>	110	45-1374	May 29-June 19
2008	<i>R/V Vizconde de Eza</i>	122	45-1374	May 27-June 16
2009	<i>R/V Vizconde de Eza</i>	109	45-1374	May 31-June 18
2010	<i>R/V Vizconde de Eza</i>	95	45-1374	May 30-June 18
2011	<i>R/V Vizconde de Eza</i>	122	44-1450	June 5-June 24
2012	<i>R/V Vizconde de Eza</i>	122	44-1450	June 3-June 21
2013	<i>R/V Vizconde de Eza</i>	122	44-1450	June 1-June 21

(*)For the calculation of the series, 83 hauls were taken from the *R/V Vizconde de Eza* and 40 hauls from the *C/V Playa de Mendiña* (123 hauls in total)

Table 2.- Swept area and number of hauls by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2009-2013. Swept area in square miles. n.s. means stratum not surveyed.

Stratum	2009		2010		2011		2012		2103	
	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number
353	0.0345	3	0.0225	2	0.0349	3	0.0338	3	0.0349	3
354	0.0338	3	0.0225	2	0.0345	3	0.0338	3	0.0338	3
355	0.0233	2	0.0229	2	0.0233	2	0.0229	2	0.0225	2
356	0.0229	2	0.0225	2	0.0229	2	0.0225	2	0.0225	2
357	0.0116	2	0.0225	2	0.0225	2	0.0229	2	0.0236	2
358	0.0341	3	0.0225	2	0.0345	3	0.0330	3	0.0338	3
359	0.0795	7	0.0705	6	0.0806	7	0.0806	7	0.0829	7
360	0.2273	20	0.1628	14	0.2374	20	0.2344	20	0.2231	19
374	0.0225	2	0.0225	2	0.0225	2	0.0229	2	0.0233	2
375	0.0341	3	0.0364	3	0.0360	3	0.0349	3	0.0360	3
376	0.1133	10	0.0788	7	0.1178	10	0.1181	10	0.1305	11
377	0.0225	2	0.0233	2	0.0233	2	0.0229	2	0.0236	2
378	0.0229	2	0.0225	2	0.0240	2	0.0229	2	0.0225	2
379	0.0229	2	0.0229	2	0.0221	2	0.0225	2	0.0240	2
380	0.0229	2	0.0236	2	0.0229	2	0.0229	2	0.0229	2
381	0.0229	2	0.0244	2	0.0233	2	0.0221	2	0.0244	2
382	0.0450	4	0.0233	2	0.0450	4	0.0454	4	0.0484	4
721	0.0229	2	0.0225	2	0.0229	2	0.0233	2	0.0225	2
722	0.0225	2	0.0225	2	0.0225	2	0.0221	2	0.0221	2
723	0.0225	2	0.0225	2	0.0218	2	0.0225	2	0.0221	2
724	0.0233	2	0.0229	2	0.0233	2	0.0225	2	0.0225	2
725	0.0229	2	0.0233	2	0.0240	2	0.0225	2	0.0229	2
726	0.0229	2	0.0233	2	0.0225	2	0.0221	2	0.0221	2
727	0.0113	1	0.0240	2	0.0225	2	0.0233	2	0.0229	2
728	0.0229	2	0.0240	2	0.0229	2	0.0229	2	0.0233	2
752	0.0229	2	0.0240	2	0.0236	2	0.0229	2	0.0233	2
753	0.0116	1	n.s.	n.s.	0.0225	2	0.0221	2	0.0236	2
754	0.0113	1	0.0225	2	0.0225	2	0.0221	2	0.0240	2
755	0.0116	1	0.0120	1	0.0454	4	0.0446	4	0.0454	4
756	0.0225	2	0.0225	2	0.0206	2	0.0221	2	0.0229	2
757	0.0229	2	0.0221	2	0.0236	2	0.0214	2	0.0240	2
758	0.0225	2	0.0225	2	0.0225	2	0.0221	2	0.0225	2
759	0.0113	1	0.0225	2	0.0218	2	0.0221	2	0.0225	2
760	0.0229	2	0.0225	2	0.0214	2	0.0225	2	0.0229	2
761	0.0225	2	0.0229	2	0.0236	2	0.0221	2	0.0225	2
762	0.0225	2	0.0229	2	0.0225	2	0.0225	2	0.0218	2
763	n.s.	n.s.	n.s.	n.s.	0.0349	3	0.0330	3	0.0341	3
764	0.0116	1	n.s.	n.s.	0.0225	2	0.0225	2	0.0214	2
765	0.0225	2	0.0225	2	0.0225	2	0.0229	2	0.0221	2
766	0.0225	2	0.0225	2	0.0225	2	0.0225	2	0.0221	2
767	n.s.	n.s.	n.s.	n.s.	0.0233	2	0.0203	2	0.0218	2

Table 3.- Yellowtail flounder mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2009-2013. n.s. means stratum not surveyed.

Stratum	2009		2010		2011		2012		2013	
	Y. flounder Mean catch	Y. flounder SD	Y. flounder Mean catch	Y. flounder SD	Y. flounder Mean catch	Y. flounder SD	Y. flounder Mean catch	Y. flounder SD	Y. flounder Mean catch	Y. flounder SD
353	0.15	0.26	0.71	1.00	102.27	174.28	8.95	11.40	34.81	57.68
354	0.00	0.00	0.69	0.21	0.73	1.26	0.70	0.72	0.77	0.69
355	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.53	0.00	0.00
356	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
357	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
358	0.00	0.00	0.00	0.00	0.40	0.52	0.33	0.57	0.00	0.00
359	11.16	31.08	12.37	23.16	185.14	189.10	119.95	124.26	181.82	196.72
360	358.38	377.70	334.16	217.33	387.48	462.00	488.22	421.61	483.74	388.87
374	1392.90	938.05	482.80	229.39	1395.85	984.36	866.88	184.87	464.43	48.88
375	335.84	149.89	330.53	153.30	525.01	446.25	208.41	145.08	355.94	244.38
376	514.96	250.66	691.28	309.96	492.44	283.95	428.35	131.41	430.94	166.13
377	0.12	0.16	122.58	75.07	325.75	399.73	405.96	79.05	75.45	106.70
378	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
379	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
380	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
381	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.83	18.14
382	0.00	0.00	325.95	460.96	223.67	447.34	67.41	80.33	7.30	14.60
721	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
722	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
723	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
724	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
725	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
726	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
727	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
728	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
752	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
753	0.00	-	n.s.	n.s.	0.00	0.00	0.00	0.00	0.00	0.00
754	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
755	0.00	-	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00
756	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
757	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
758	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
759	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
760	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
761	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
762	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
763	n.s.	n.s.	n.s.	n.s.	0.00	0.00	0.00	0.00	0.00	0.00
764	0.00	-	n.s.	n.s.	0.00	0.00	0.00	0.00	0.00	0.00
765	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
766	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
767	n.s.	n.s.	n.s.	n.s.	0.00	0.00	0.00	0.00	0.00	0.00

Table 4.- Yellowtail flounder survey biomass (t) by stratum in NAFO Div. 3NO: 2009-2013. n.s. means stratum not surveyed.

Strata	2009	2010	2011	2012	2013	Strata	2009	2010	2011	2012	2013
353	4	17	2366	214	806	725	0	0	0	0	0
354	0	15	16	15	17	726	0	0	0	0	0
355	0	0	0	2	0	727	0	0	0	0	0
356	0	0	0	0	0	728	0	0	0	0	0
357	0	0	0	0	0	752	0	0	0	0	0
358	0	0	8	7	0	753	0	n.s.	0	0	0
359	473	443	6767	4384	6466	754	0	0	0	0	0
360	87779	79998	90856	115943	114639	755	0	0	0	0	0
374	26496	9184	26552	16220	8549	756	0	0	0	0	0
375	8001	7388	11857	4858	8038	757	0	0	0	0	0
376	60659	81971	55789	48374	48457	758	0	0	0	0	0
377	1	1054	2802	3549	639	759	0	0	0	0	0
378	0	0	0	0	0	760	0	0	0	0	0
379	0	0	0	0	0	761	0	0	0	0	0
380	0	0	0	0	0	762	0	0	0	0	0
381	0	0	0	0	152	763	0	n.s.	0	0	0
382	0	9617	6819	2038	207	764	0	n.s.	0	0	0
721	0	0	0	0	0	765	0	0	0	0	0
722	0	0	0	0	0	766	0	0	0	0	0
723	0	0	0	0	0	767	0	n.s.	0	0	0
724	0	0	0	0	0						

Table 5.- Yellowtail flounder survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by year in NAFO Div. 3NO: 1995-2013.

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Biomass	9264	43349	38697	122601	197012	144685	182704	148487	136775	169978
SD	2484	6032	8527	31359	22938	19097	25847	23368	19287	18869
MCPT	16.22	59.54	47.74	137.32	232.41	167.76	210.84	164.28	148.92	190.05
SD	4.37	8.41	10.69	34.70	27.41	22.21	30.58	24.92	20.84	21.27

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013
Biomass	156472	160145	160731	160146	183412	189687	203833	195606	187969
SD	15271	16458	18852	17297	25736	22611	30743	23679	22493
MCPT	176.42	189.32	202.64	178.27	209.43	224.54	231.22	221.33	214.17
SD	17.06	19.83	23.61	19.00	29.75	26.30	35.18	26.27	25.35

Table 6.- Yellowtail flounder length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2009-2013. E(x) means Error of the parameter x.

Males							Females						Total					
Year	a	b	E (a)	E (b)	R2	N	a	b	E (a)	E (b)	R2	N	a	b	E (a)	E (b)	R2	N
2009	0.00512	3.11086	0.171	0.0519	0.993	270	0.0066	3.0549	0.1594	0.0464	0.991	378	0.0067	3.0502	0.1293	0.0379	0.994	648
2010	0.00835	2.98405	0.1175	0.0367	0.995	313	0.0058	3.0980	0.0809	0.0241	0.998	444	0.0052	3.1285	0.0966	0.029	0.996	759
2011	0.01213	2.87117	0.2513	0.0758	0.981	435	0.0063	3.0725	0.1587	0.0462	0.992	575	0.0080	3.0081	0.1225	0.0366	0.994	1015
2012	0.00940	2.94448	0.3281	0.1018	0.984	417	0.0047	3.1527	0.2378	0.0712	0.992	494	0.0048	3.1471	0.2299	0.0699	0.992	914
2013	0.00147	3.47842	0.8688	0.2588	0.866	436	0.0110	2.9156	0.1599	0.0463	0.991	588	0.0055	3.1012	0.2729	0.0839	0.968	1039

Table 7.- Yellowtail flounder mean number per tow by year in Spanish Spring surveys in NAFO Div. 3NO: 1995-2013. Indet. means indeterminate

	1995				1996				1997				1998				1999			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	31.12	47.36	6.14	84.62	73.11	188.83	13.23	275.17	134.85	147.98	0.00	282.83	279.83	343.35	1.61	624.79	508.72	539.70	4.48	1052.90
	2000				2001				2002				2003				2004			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	332.06	376.36	0.00	708.42	328.27	428.33	6.98	763.57	256.56	333.09	0.81	590.46	215.96	271.49	0.72	488.17	322.91	336.03	1.19	660.14
	2005				2006				2007				2008				2009			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	275.52	308.25	0.30	584.07	281.15	354.69	0.60	636.44	317.34	365.53	0.10	682.97	295.11	335.10	0.15	630.35	298.01	398.88	0.48	697.37
	2010				2011				2012				2013							
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total				
MNPT	368.83	414.09	0.00	782.92	305.92	426.42	0.00	732.34	315.50	438.48	0.75	754.73	294.58	394.06	0.79	689.43				

Table 8.- Yellowtail flounder mean number per tow by length class and year. Spanish Spring Survey on NAFO 3NO: 2009-2013. Indet. means indeterminate.

Lenght (cm.)	2009				2010				2011				2012				2013			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	0.050	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.297	0.297
8	0.000	0.000	0.057	0.057	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.066	0.066	0.000	0.043	0.076	0.119
10	0.000	0.155	0.000	0.155	0.302	0.302	0.000	0.605	0.000	0.000	0.000	0.000	0.000	0.000	0.096	0.096	0.000	0.000	0.076	0.076
12	0.000	0.063	0.370	0.433	1.243	0.364	0.000	1.607	0.000	0.000	0.000	0.000	0.294	0.096	0.085	0.475	0.000	0.000	0.078	0.078
14	0.000	0.096	0.000	0.096	0.387	0.400	0.000	0.787	0.077	0.013	0.000	0.090	0.683	0.292	0.210	1.185	0.071	0.097	0.147	0.314
16	0.920	0.498	0.000	1.418	0.489	0.107	0.000	0.596	0.698	0.627	0.000	1.324	0.548	0.507	0.000	1.055	0.328	0.071	0.060	0.458
18	2.260	1.452	0.000	3.712	1.276	0.982	0.000	2.259	2.421	2.221	0.000	4.642	0.845	0.663	0.289	1.797	0.253	0.253	0.060	0.565
20	4.032	3.251	0.000	7.283	3.363	2.601	0.000	5.964	2.628	3.051	0.000	5.678	2.130	2.825	0.000	4.955	0.891	1.003	0.000	1.894
22	11.271	7.825	0.000	19.096	6.263	8.252	0.000	14.515	2.412	2.282	0.000	4.694	7.317	6.789	0.000	14.106	2.740	3.140	0.000	5.879
24	15.826	15.693	0.000	31.518	19.027	15.268	0.000	34.295	8.451	5.504	0.000	13.954	11.515	10.017	0.000	21.532	7.487	8.263	0.000	15.749
26	28.577	26.217	0.000	54.793	44.312	25.334	0.000	69.646	25.580	14.079	0.000	39.659	29.809	19.368	0.000	49.177	23.234	16.665	0.000	39.898
28	38.271	24.052	0.000	62.323	60.163	45.618	0.000	105.781	52.525	34.993	0.000	87.517	69.232	42.103	0.000	111.335	54.912	27.949	0.000	82.861
30	59.751	26.094	0.000	85.844	86.814	52.865	0.000	139.679	70.813	52.249	0.000	123.062	81.097	64.012	0.000	145.109	78.158	46.704	0.000	124.862
32	73.655	42.701	0.000	116.356	92.461	52.351	0.000	144.811	80.108	53.396	0.000	133.504	66.077	63.104	0.000	129.181	73.177	62.970	0.000	136.146
34	44.085	74.201	0.000	118.285	40.660	66.701	0.000	107.361	44.691	75.990	0.000	120.681	33.748	73.592	0.000	107.340	37.376	68.287	0.000	105.662
36	13.976	81.708	0.000	95.684	9.675	70.786	0.000	80.461	12.199	76.297	0.000	88.496	8.716	67.450	0.000	76.166	12.654	65.653	0.000	78.307
38	4.267	54.934	0.000	59.200	1.757	41.724	0.000	43.481	2.488	53.131	0.000	55.619	2.711	49.593	0.000	52.305	2.544	49.874	0.000	52.418
40	0.983	22.221	0.000	23.203	0.631	18.241	0.000	18.872	0.618	32.793	0.000	33.411	0.432	23.634	0.000	24.066	0.522	26.657	0.000	27.179
42	0.103	11.373	0.000	11.476	0.000	8.403	0.000	8.403	0.124	15.014	0.000	15.138	0.181	9.291	0.000	9.472	0.173	10.849	0.000	11.022
44	0.039	4.532	0.000	4.571	0.000	1.785	0.000	1.785	0.083	2.984	0.000	3.067	0.166	3.726	0.000	3.893	0.062	4.626	0.000	4.688
46	0.000	1.183	0.000	1.183	0.000	1.496	0.000	1.496	0.000	1.351	0.000	1.351	0.000	1.032	0.000	1.032	0.000	0.746	0.000	0.746
48	0.000	0.173	0.000	0.173	0.000	0.341	0.000	0.341	0.000	0.404	0.000	0.404	0.000	0.242	0.000	0.242	0.000	0.114	0.000	0.114
50	0.000	0.460	0.000	0.460	0.000	0.034	0.000	0.034	0.000	0.045	0.000	0.045	0.000	0.051	0.000	0.051	0.000	0.032	0.000	0.032
52	0.000	0.000	0.000	0.000	0.000	0.139	0.000	0.139	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
54	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.061	0.000	0.061
56	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
58	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.096	0.000	0.096	0.000	0.000	0.000	0.000
Total	298.014	398.879	0.477	697.369	368.825	414.092	0.000	782.917	305.915	426.422	0.000	732.337	315.502	438.483	0.746	754.732	294.581	394.056	0.794	689.431
N° samples:				38				36				50				52				48
N° Ind.:	3969	4682	5	8656	3085	3615	0	6700	5500	6259	0	11759	4523	6150	10	10683	5314	6587	16	11917
Sampled catch:				2604				1805				3535				3104				3504
Range:				7-50				10-52				15-50				8-58				6-54
Total catch:				16201				12449				20193				18359				17513
Total hauls:				109				95				122				122				122

Table 9.- Redfish mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2009-2013. n.s. means stratum not surveyed.

Stratum	2009		2010		2011		2012		2013	
	Redfish Mean catch	Redfish SD	Redfish Mean catch	Redfish SD	Redfish Mean catch	Redfish SD	Redfish Mean catch	Redfish SD	Redfish Mean catch	Redfish SD
353	0.11	0.20	0.00	0.00	0.00	0.00	0.72	1.24	0.00	0.00
354	2.67	3.87	29.30	41.44	587.53	942.29	619.75	1060.35	431.90	381.59
355	851.40	56.00	5282.60	4804.93	1956.76	2348.81	1623.62	2024.90	1105.03	988.99
356	1109.75	350.37	8633.50	10276.38	9703.11	13219.52	743.76	412.94	2279.44	1078.20
357	12944.66	6837.52	2457.65	1593.47	1120.60	652.52	1854.81	578.30	3014.35	399.30
358	4709.51	3691.88	8024.32	2799.69	13416.77	6326.07	3834.12	2560.26	6128.11	4776.40
359	0.42	1.08	862.61	2111.16	303.76	788.21	39.35	71.61	485.72	916.88
360	0.20	0.88	0.05	0.18	0.00	0.00	0.00	0.00	0.13	0.56
374	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
375	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
376	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00
377	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.10	11.46
378	1001.95	1399.44	1299.45	1820.59	5408.50	7648.77	7654.12	6271.87	16064.18	4986.26
379	12745.33	5943.47	7462.75	1908.83	614.93	371.05	1554.75	1041.50	612.35	167.09
380	21.74	24.37	2655.59	1400.93	4428.38	5668.85	1702.30	1955.07	1342.03	1381.01
381	0.08	0.09	0.22	0.17	33.05	41.37	632.95	300.81	3.41	1.80
382	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
721	3197.60	4102.63	146.95	34.72	771.50	342.38	280.40	107.48	506.51	347.74
722	2.58	0.18	3.17	3.72	5.74	6.86	6.14	2.96	2.86	2.62
723	9914.19	12350.06	747.32	309.32	1372.65	1455.72	1769.92	622.99	1666.69	1188.21
724	173.01	122.61	125.43	48.68	73.65	34.44	101.05	23.12	113.34	157.35
725	398.45	69.37	1271.77	1290.71	117.82	15.61	287.95	8.56	516.20	347.61
726	301.95	427.02	261.10	349.17	45.70	57.98	24.80	14.99	15.72	3.99
727	279.10	-	63.30	25.60	43.05	37.55	16.30	0.71	338.35	442.58
728	30.65	7.99	26.80	16.40	4.16	0.56	12.54	6.45	31.05	34.15
752	6.16	8.70	1.94	0.73	0.85	1.20	0.66	0.06	2.22	3.14
753	0.00	-	n.s.	n.s.	0.00	0.00	0.00	0.00	0.00	0.00
754	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.64
755	0.00	-	0.00	-	0.00	0.00	0.00	0.00	0.19	0.38
756	4.05	5.73	0.90	0.19	0.10	0.14	0.66	0.01	0.00	0.00
757	0.20	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.53
758	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
759	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
760	7.96	0.01	2.23	3.15	10.30	14.15	0.00	0.00	1.56	1.65
761	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
762	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
763	n.s.	n.s.	n.s.	n.s.	0.71	1.22	0.00	0.00	0.00	0.00
764	0.61	-	n.s.	n.s.	2.91	4.11	0.00	0.00	0.00	0.00
765	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
766	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
767	n.s.	n.s.	n.s.	n.s.	0.00	0.00	0.00	0.00	0.00	0.00

Table 10.- Redfish survey biomass (t) by stratum in NAFO Div. 3NO: 2009-2013. n.s. means stratum not surveyed.

Strata	2009	2010	2011	2012	2013	Strata	2009	2010	2011	2012	2013
353	3	0	0	17	0	725	3658	11487	1031	2688	4739
354	58	641	12568	13552	9444	726	1901	1617	292	161	102
355	5420	34178	12456	10505	7269	727	2382	506	367	135	2840
356	4560	36069	39873	3107	9523	728	209	174	28	86	208
357	365234	35827	16336	26596	41850	752	70	21	9	8	25
358	93155	160486	262502	78425	122562	753	0	n.s.	0	0	0
359	18	30907	11103	1438	17272	754	0	0	0	0	7
360	48	11	0	0	30	755	0	0	0	0	6
374	0	0	0	0	0	756	36	8	1	6	0
375	0	0	0	0	0	757	2	0	0	0	3
376	0	0	1	0	0	758	0	0	0	0	0
377	0	0	0	0	69	759	0	0	0	0	0
378	12177	16055	62648	93021	198482	760	107	30	148	0	21
379	118121	69163	5892	14649	5409	761	0	0	0	0	0
380	182	21582	37169	14288	11264	762	0	0	0	0	0
381	1	3	409	8239	40	763	n.s.	n.s.	16	0	0
382	0	0	0	0	0	764	5	n.s.	26	0	0
721	18172	849	4384	1568	2926	765	0	0	0	0	0
722	19	24	43	47	22	766	0	0	0	0	0
723	136596	10296	19564	24386	23352	767	n.s.	n.s.	0	0	0
724	1845	1360	786	1114	1249						

Table 11.- Redfish survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by year and Division in NAFO Div. 3NO: 1997-2013.

Div	Year	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total	Biomass	5947	40909	76564	99226	63350	11172	15714	35275	157716
	SD	988	20512	27740	33453	41460	2374	3224	7332	52646
	MCPT	6.79	43.25	85.45	112.71	73.14	12.43	17.21	38.60	175.79
	SD	1.15	19.50	29.56	40.03	48.13	2.60	3.55	8.05	58.86
	N° Strata	36	41	41	41	41	41	41	41	41
3N	Biomass	4753	22540	46459	68928	53855	7620	11031	27016	146918
	SD	353	17632	25022	33109	41371	2106	3199	7174	52267
	MCPT	6.14	26.32	58.78	90.12	71.16	9.62	13.83	33.95	187.61
	SD	0.46	18.33	30.08	45.16	55.00	2.61	4.05	9.06	67.31
	N° Strata	27	31	31	31	31	31	31	31	31
3O	Biomass	1194	18369	30105	30298	9494	3552	4684	8259	10797
	SD	922	10490	12129	6073	2702	1117	369	1326	2728
	MCPT	11.41	159.86	269.16	268.32	86.80	31.74	40.55	70.63	94.35
	SD	8.68	87.87	107.03	54.27	24.47	9.78	3.10	11.68	24.19
	N° Strata	9	10	10	10	10	10	10	10	10
3N/Total (%) Bioma		80	55	61	69	85	68	70	77	93

		2006	2007	2008	2009	2010	2011	2012	2013
Total	Biomass	103029	98805	74172	763980	431296	487655	294033	458716
	SD	23332	15893	26168	145765	69575	107982	62954	76825
	MCPT	118.76	125.66	82.20	670.46	506.43	543.17	320.52	502.58
	SD	27.83	20.19	29.14	172.93	81.06	124.68	72.27	79.94
		41	36	41	39	37	41	41	41
3N	Biomass	87830	87602	68059	735743	359536	418305	265238	429532
	SD	22675	15364	25890	143334	58306	99454	60304	76128
	MCPT	115.44	124.79	86.51	721.67	473.94	533.85	330.89	539.18
	SD	30.96	22.09	33.12	194.48	76.53	132.71	80.20	91.06
	N° Strata	31	28	31	30	29	31	31	31
3O	Biomass	15199	11203	6113	28238	71760	69350	28795	29184
	SD	5279	3362	3258	16762	37821	41858	16754	7503
	MCPT	141.64	132.90	52.55	280.98	772.76	607.40	249.04	250.43
	SD	52.04	39.93	28.27	163.87	402.81	362.85	140.90	64.52
	N° Strata	10	8	10	9	8	10	10	10
3N/Total (%) Biomass		85	89	92	96	83	86	90	94

Table 12.- Redfish length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2009-2013. E(x) means Error of the parameter x.

Males							Females						Total					
Year	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N
2009	0.00929	0.10590	3.08247	0.0341	0.996	272	0.0121	0.1250	3.01342	0.0389	0.995	258	0.0083	0.1427	3.12393	0.046	0.992	532
2010	0.01286	0.07840	3.0017	0.0248	0.998	282	0.0140	0.0892	2.98638	0.0275	0.998	298	0.0105	0.0668	3.06573	0.0217	0.998	585
2011	0.01148	0.10130	3.0459	0.0311	0.997	524	0.0131	0.1267	3.01034	0.0386	0.995	588	0.0047	0.1154	3.30791	0.0368	0.995	1235
2012	0.01148	0.12340	2.9031	0.0371	0.998	341	0.0167	0.1631	2.94082	0.049	0.996	418	0.0158	0.1171	2.95433	0.0351	0.998	759
2013	0.01306	0.13360	2.98309	0.0409	0.994	482	0.0149	0.1068	2.95412	0.0312	0.997	479	0.0106	0.0838	3.04983	0.0263	0.997	1017

Table 13.- Redfish mean number per tow by year in Spanish Spring surveys in NAFO Div. 3NO: 1997-2013. Indet. means indeterminate

	1997				1998				1999				2000				2001			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	22.38	14.94	0.00	37.32	108.36	114.09	0.02	222.47	289.50	200.84	0.39	490.73	518.31	326.79	0.00	845.10	279.45	158.85	1.10	439.41
	2002				2003				2004				2005				2006			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	46.49	37.53	1.05	85.06	71.00	46.21	0.82	118.03	122.61	94.97	19.57	237.15	573.80	502.15	95.21	1171.16	398.90	293.94	247.70	940.54
	2007				2008				2009				2010				2011			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	368.68	313.47	3.01	685.15	329.78	259.80	2.00	591.59	3754.48	2846.50	3.64	6604.62	2009.91	1807.51	0.23	3817.65	2385.24	1906.21	9.10	4300.55
	2012				2013															
	Males	Females	Indet.	Total	Males	Females	Indet.	Total												
MNPT	1184.89	981.01	0.31	2166.20	2034.96	1542.08	0.38	3577.42												

Table 14.- Redfish mean number per tow by length class and year. Spanish Spring Survey on NAFO 3NO: 2009-2013. Indet. means indeterminate.

Lenght (cm.)	2009				2010				2011				2012				2013			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
4	0.000	0.000	0.029	0.029	0.000	0.000	0.130	0.130	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	0.012	0.006	0.157	0.175	0.007	0.000	0.101	0.109	0.000	0.000	0.174	0.174	0.000	0.000	0.039	0.039	0.000	0.000	0.327	0.327
8	0.561	0.214	0.383	1.158	0.015	0.019	0.000	0.033	0.000	0.000	0.155	0.155	0.000	0.000	0.182	0.182	0.427	0.000	0.056	0.482
10	17.045	1.568	0.282	18.894	0.015	0.000	0.000	0.015	0.000	0.074	0.177	0.251	0.000	0.000	0.077	0.077	0.247	0.000	0.000	0.247
12	22.492	11.619	0.194	34.304	0.015	0.007	0.000	0.022	0.990	0.456	1.294	2.741	0.004	0.036	0.008	0.049	0.207	0.000	0.000	0.207
14	69.841	31.618	0.173	101.633	0.184	0.000	0.000	0.184	11.860	8.726	7.290	27.876	1.181	1.981	0.000	3.162	0.329	0.000	0.000	0.329
16	651.956	387.072	0.000	1039.028	108.602	26.757	0.000	135.358	61.607	64.245	0.007	125.860	23.574	5.428	0.000	29.001	4.075	1.763	0.000	5.838
18	2024.106	1346.781	2.424	3373.311	823.922	542.608	0.000	1366.530	766.590	365.669	0.000	1132.259	191.476	74.149	0.000	265.624	152.717	45.982	0.000	198.698
20	435.925	536.721	0.000	972.645	610.079	704.422	0.000	1314.501	1215.754	991.597	0.000	2207.351	715.886	393.611	0.000	1109.497	1266.873	551.383	0.000	1818.256
22	268.644	161.718	0.000	430.363	219.541	214.975	0.000	434.516	219.501	310.021	0.000	529.522	167.953	303.957	0.000	471.910	496.753	707.239	0.000	1203.992
24	188.590	165.000	0.000	353.591	178.206	127.535	0.000	305.742	85.212	73.057	0.000	158.269	50.679	80.796	0.000	131.475	71.268	143.489	0.000	214.758
26	47.409	126.397	0.000	173.806	51.762	94.471	0.000	146.233	17.255	39.551	0.000	56.806	23.257	40.965	0.000	64.222	24.290	44.182	0.000	68.472
28	16.106	49.709	0.000	65.815	9.461	49.090	0.000	58.551	4.258	28.841	0.000	33.099	7.073	43.349	0.000	50.422	3.186	23.874	0.000	27.060
30	4.672	20.094	0.000	24.765	2.305	26.479	0.000	28.783	0.384	17.283	0.000	17.667	1.459	23.110	0.000	24.569	5.827	16.799	0.000	22.626
32	1.869	4.131	0.000	6.000	1.388	12.161	0.000	13.549	0.460	4.280	0.000	4.740	0.653	6.588	0.000	7.241	2.200	4.369	0.000	6.569
34	1.645	2.313	0.000	3.958	2.257	5.426	0.000	7.684	0.585	1.460	0.000	2.045	0.567	3.613	0.000	4.179	1.655	1.804	0.000	3.459
36	3.251	1.316	0.000	4.567	1.104	1.764	0.000	2.869	0.479	0.639	0.000	1.118	0.629	2.010	0.000	2.639	4.402	0.781	0.000	5.183
38	0.165	0.180	0.000	0.345	0.671	0.775	0.000	1.447	0.195	0.237	0.000	0.431	0.368	0.495	0.000	0.863	0.291	0.293	0.000	0.584
40	0.078	0.013	0.000	0.092	0.375	0.589	0.000	0.963	0.113	0.030	0.000	0.143	0.119	0.056	0.000	0.175	0.126	0.070	0.000	0.196
42	0.090	0.022	0.000	0.112	0.000	0.236	0.000	0.236	0.000	0.036	0.000	0.036	0.007	0.006	0.000	0.013	0.085	0.046	0.000	0.131
44	0.028	0.006	0.000	0.034	0.000	0.201	0.000	0.201	0.000	0.007	0.000	0.007	0.000	0.000	0.000	0.000	0.004	0.004	0.000	0.008
46	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
48	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.860	0.000	0.860	0.000	0.000	0.000	0.000
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
52	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	3754.484	2846.498	3.642	6604.624	2009.908	1807.515	0.232	3817.654	2385.243	1906.208	9.097	4300.549	1184.885	981.008	0.306	2166.200	2034.960	1542.077	0.383	3577.420
Nº samples:				39				42				44				43				51
Nº Ind.:	3418	2763	68	6249	2796	2841	32	5669	3845	3633	241	7719	4019	3986	40	8045	4182	4210	34	8426
Sampled catch:				1034				1265				1524				1517				1726
Range:				5-44				5-45				6-45				7-49				6-45
Total catch:				99847				82169				95569				50184				78332
Total hauls:				109				95				122				122				122

Table 15.- Witch flounder mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2009-2013. n.s. means stratum not surveyed.

Stratum	2009		2010		2011		2012		2013	
	W. flounder Mean catch	W. flounder SD	W. flounder Mean catch	W. flounder SD	W. flounder Mean catch	W. flounder SD	W. flounder Mean catch	W. flounder SD	W. flounder Mean catch	W. flounder SD
353	0.36	0.31	39.92	28.26	2.41	1.95	16.99	26.78	11.01	10.52
354	12.07	9.07	4.96	2.36	5.13	4.97	4.02	1.78	9.32	9.37
355	5.58	1.31	2.20	1.67	3.29	0.30	3.16	1.89	0.05	0.07
356	4.12	5.21	0.74	0.08	0.51	0.35	0.42	0.60	0.85	0.78
357	2.89	3.66	1.33	1.88	1.99	1.53	1.08	1.52	0.42	0.59
358	4.16	2.88	9.24	4.76	3.06	1.64	7.32	7.14	2.61	1.01
359	1.69	2.56	2.18	3.39	4.28	3.67	10.55	10.81	10.92	16.98
360	0.00	0.00	3.11	8.67	1.19	3.60	3.93	9.01	1.36	2.90
374	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
375	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.45	0.00	0.00
376	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.11	0.23
377	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.63
378	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.25	0.52	0.74
379	0.65	0.92	0.73	0.64	0.18	0.26	0.64	0.48	0.00	0.00
380	0.05	0.06	0.92	1.29	0.22	0.30	0.72	1.01	0.38	0.53
381	0.00	0.00	0.00	0.00	1.81	0.57	3.38	4.78	1.12	0.93
382	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.74
721	11.32	11.99	3.19	2.86	2.01	1.84	0.75	0.42	0.91	0.17
722	3.26	3.12	1.98	1.18	0.72	0.61	0.60	0.78	2.69	0.22
723	5.75	2.62	11.45	1.94	5.93	2.88	1.55	0.04	2.39	1.88
724	15.65	18.27	10.10	6.09	8.23	7.44	14.94	19.04	8.61	7.74
725	4.94	2.92	3.18	3.24	2.09	1.02	1.48	0.46	5.05	3.16
726	64.76	75.60	5.78	1.00	7.45	5.56	3.51	2.07	18.48	15.11
727	3.42	-	11.71	9.08	3.55	3.91	6.47	9.15	10.31	1.20
728	11.28	8.11	21.82	16.52	8.07	3.58	17.53	3.19	8.38	9.72
752	0.74	1.04	0.22	0.32	1.29	1.83	1.80	1.98	4.85	6.86
753	0.00	-	n.s.	n.s.	1.06	1.50	0.00	0.00	0.70	0.99
754	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
755	0.00	-	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00
756	17.15	21.07	25.45	10.90	7.74	4.11	4.73	6.24	5.21	7.37
757	2.52	3.56	3.91	5.53	1.73	2.45	1.60	1.81	5.29	1.22
758	0.00	0.00	0.69	0.98	0.00	0.00	0.00	0.00	0.00	0.00
759	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
760	13.95	4.60	3.50	0.37	8.66	7.10	7.82	10.16	6.63	7.71
761	1.09	1.54	9.75	13.78	5.58	7.07	5.99	5.46	2.30	2.61
762	0.00	0.00	1.06	1.50	0.00	0.00	0.00	0.00	0.00	0.00
763	n.s.	n.s.	n.s.	n.s.	0.00	0.00	0.00	0.00	0.00	0.00
764	0.64	-	n.s.	n.s.	1.35	0.38	0.99	0.45	5.16	3.17
765	3.38	1.82	1.81	0.48	0.68	0.60	0.16	0.22	0.26	0.02
766	0.71	1.01	0.83	1.17	0.35	0.49	0.27	0.06	0.00	0.00
767	n.s.	n.s.	n.s.	n.s.	0.00	0.00	0.00	0.00	0.00	0.00

Table 16.- Witch flounder survey biomass (t) by stratum in NAFO Div. 3NO: 2009-2013. n.s. means stratum not surveyed.

Strata	2009	2010	2011	2012	2013	Strata	2009	2010	2011	2012	2013
353	8	955	56	406	255	725	45	29	18	14	46
354	264	108	110	88	204	726	408	36	48	23	120
355	35	14	21	20	0	727	29	94	30	53	86
356	17	3	2	2	4	728	77	142	55	120	56
357	82	19	29	15	6	752	8	2	14	21	55
358	82	185	60	150	52	753	0	n.s.	13	0	8
359	42	78	157	386	388	754	0	0	0	0	0
360	0	745	280	933	323	755	0	0	0	0	0
374	0	0	0	0	0	756	154	228	76	43	46
375	0	0	0	6	0	757	22	36	15	15	45
376	0	0	0	1	12	758	0	6	0	0	0
377	0	0	0	0	4	759	0	0	0	0	0
378	0	0	0	2	6	760	188	48	125	107	89
379	6	7	2	6	0	761	17	146	81	93	35
380	0	7	2	6	3	762	0	20	0	0	0
381	0	0	22	44	13	763	n.s.	n.s.	0	0	0
382	0	0	0	0	16	764	6	n.s.	12	9	48
721	64	18	11	4	5	765	37	20	8	2	3
722	24	15	5	5	20	766	9	11	4	3	0
723	79	158	84	21	33	767	n.s.	n.s.	0	0	0
724	167	109	88	165	95						

Table 17.- Witch flounder survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by year and Division in NAFO Div. 3NO: 1997-2013.

Year	2002	2003	2004	2005	2006	2007
Biomass	1784	3145	3348	2633	2570	1480
SD	426	690	523	488	629	229
MCPT	2.00	3.42	3.66	2.95	3.01	1.84
SD	0.49	0.75	0.56	0.56	0.73	0.28

Year	2008	2009	2010	2011	2012	2013
Biomass	2118	1872	3239	1428	2763	2078
SD	481	423	777	248	648	367
MCPT	2.32	2.13	3.82	1.58	3.06	2.32
SD	0.52	0.48	0.91	0.28	0.74	0.41

Table 18.- Witch flounder length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2009-2013. E(x) means Error of the parameter x.

Year	Males						Females						Total					
	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N
2009	0.00145	3.39789	0.2014	0.0595	0.991	163	0.00112	3.47934	0.1242	0.0356	0.997	232	0.00490	3.05993	0.4298	0.1269	0.94	397
2010	0.00253	3.25938	0.1923	0.0562	0.992	193	0.00161	3.38592	0.2761	0.0779	0.983	327	0.00220	3.30190	0.2230	0.0641	0.986	520
2011	0.00153	3.40467	0.2368	0.0681	0.991	180	0.00147	3.41280	0.1470	0.0418	0.995	344	0.00162	3.38866	0.1040	0.0333	0.997	529
2012	0.00202	3.31917	0.1945	0.0557	0.996	199	0.00147	3.39880	0.1746	0.0484	0.997	281	0.00162	3.38866	0.1171	0.0346	0.998	487
2013	0.00108	3.48692	0.1785	0.0532	0.994	286	0.00109	3.48450	0.0815	0.0234	0.998	563	0.00220	3.28882	0.1559	0.0480	0.991	864

Table 19.- Witch flounder mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 2009-2013. Indet. means indeterminate.

	2002				2003				2004				2005			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	2.602	3.488	0.459	6.548	4.499	5.864	0.057	10.420	4.182	6.088	0.211	10.480	4.160	5.570	0.605	10.336
	2006				2007				2008				2009			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	3.384	4.937	0.040	8.360	1.952	3.050	0.061	5.063	2.061	3.384	0.027	5.472	2.352	4.107	0.043	6.502
	2010				2011				2012				2013			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	3.538	5.411	0.000	8.949	1.326	2.529	0.033	3.887	3.350	4.078	0.056	7.483	2.009	3.908	0.159	6.076

Table 20.- Witch flounder mean number per tow by length class and year. Spanish Spring Surveys in NAFO Div. 3NO: 2009-2013. Indet. means indeterminate.

Lenght (cm.)	2009				2010				2011				2012				2013			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	0.005	0.005	0.000	0.000	0.000	0.000	0.003	0.000	0.019	0.022	0.000	0.000	0.005	0.005	0.000	0.000	0.048	0.048
8	0.000	0.000	0.020	0.020	0.000	0.000	0.000	0.000	0.000	0.003	0.013	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.050
10	0.005	0.000	0.002	0.008	0.005	0.004	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.014	0.008	0.000	0.000	0.008
12	0.000	0.000	0.002	0.002	0.018	0.028	0.000	0.046	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.011	0.005	0.000	0.008	0.012
14	0.039	0.021	0.005	0.065	0.015	0.027	0.000	0.042	0.000	0.005	0.000	0.005	0.000	0.000	0.020	0.020	0.002	0.015	0.000	0.017
16	0.020	0.056	0.008	0.084	0.015	0.000	0.000	0.015	0.010	0.025	0.000	0.035	0.009	0.006	0.006	0.021	0.011	0.021	0.000	0.032
18	0.009	0.037	0.000	0.046	0.004	0.012	0.000	0.016	0.023	0.023	0.000	0.046	0.004	0.002	0.000	0.007	0.010	0.049	0.016	0.074
20	0.029	0.019	0.000	0.048	0.016	0.011	0.000	0.027	0.003	0.025	0.000	0.028	0.013	0.013	0.000	0.025	0.024	0.002	0.016	0.042
22	0.034	0.050	0.000	0.084	0.035	0.023	0.000	0.058	0.015	0.006	0.000	0.022	0.009	0.031	0.000	0.039	0.052	0.025	0.011	0.087
24	0.068	0.138	0.000	0.206	0.016	0.059	0.000	0.074	0.010	0.013	0.000	0.023	0.024	0.030	0.000	0.054	0.055	0.078	0.011	0.144
26	0.068	0.124	0.000	0.192	0.080	0.061	0.000	0.141	0.020	0.016	0.000	0.036	0.070	0.022	0.000	0.092	0.079	0.057	0.000	0.136
28	0.206	0.217	0.000	0.422	0.134	0.096	0.000	0.231	0.032	0.047	0.000	0.079	0.116	0.125	0.000	0.241	0.093	0.141	0.000	0.233
30	0.241	0.263	0.000	0.504	0.171	0.141	0.000	0.312	0.115	0.084	0.000	0.199	0.262	0.138	0.000	0.400	0.168	0.158	0.000	0.326
32	0.344	0.373	0.000	0.718	0.181	0.234	0.000	0.415	0.186	0.146	0.000	0.332	0.345	0.222	0.000	0.567	0.263	0.260	0.000	0.524
34	0.324	0.462	0.000	0.785	0.294	0.379	0.000	0.673	0.222	0.205	0.000	0.426	0.431	0.323	0.000	0.755	0.245	0.372	0.000	0.617
36	0.355	0.432	0.000	0.786	0.775	0.513	0.000	1.288	0.214	0.276	0.000	0.490	0.474	0.324	0.000	0.798	0.261	0.379	0.000	0.640
38	0.261	0.466	0.000	0.727	0.764	0.778	0.000	1.542	0.235	0.293	0.000	0.528	0.556	0.437	0.000	0.993	0.289	0.348	0.000	0.637
40	0.174	0.371	0.000	0.545	0.534	0.718	0.000	1.252	0.179	0.308	0.000	0.487	0.514	0.570	0.000	1.085	0.234	0.417	0.000	0.652
42	0.105	0.361	0.000	0.466	0.349	1.023	0.000	1.371	0.051	0.365	0.000	0.416	0.358	0.610	0.000	0.969	0.143	0.522	0.000	0.665
44	0.058	0.422	0.000	0.480	0.106	0.505	0.000	0.611	0.009	0.388	0.000	0.397	0.148	0.582	0.000	0.730	0.058	0.442	0.000	0.500
46	0.009	0.124	0.000	0.134	0.028	0.406	0.000	0.434	0.000	0.171	0.000	0.171	0.012	0.433	0.000	0.445	0.000	0.386	0.000	0.386
48	0.004	0.105	0.000	0.109	0.000	0.226	0.000	0.226	0.000	0.065	0.000	0.065	0.004	0.142	0.000	0.146	0.009	0.154	0.000	0.163
50	0.000	0.052	0.000	0.052	0.000	0.125	0.000	0.125	0.000	0.058	0.000	0.058	0.000	0.053	0.000	0.053	0.000	0.046	0.000	0.046
52	0.000	0.000	0.000	0.000	0.000	0.033	0.000	0.033	0.000	0.007	0.000	0.007	0.000	0.006	0.000	0.006	0.000	0.029	0.000	0.029
54	0.000	0.014	0.000	0.014	0.000	0.005	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.008	0.000	0.000	0.000	0.000
56	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
58	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.006
60	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
62	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
64	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	2.352	4.107	0.043	6.502	3.538	5.411	0.000	8.949	1.326	2.529	0.033	3.887	3.350	4.078	0.056	7.483	2.009	3.908	0.159	6.076
Nº samples:				44				48				64				67				67
Nº Ind.:	418	625	12	1055	350	609	0	959	193	377	5	575	392	541	11	944	315	592	25	932
Sampled catch:				350				399				220				398				330
Range:				6-55				11-56				7-52				7-55				6-58
Total catch:				401				410				235				398				356
Total hauls:				109				95				122				122				122

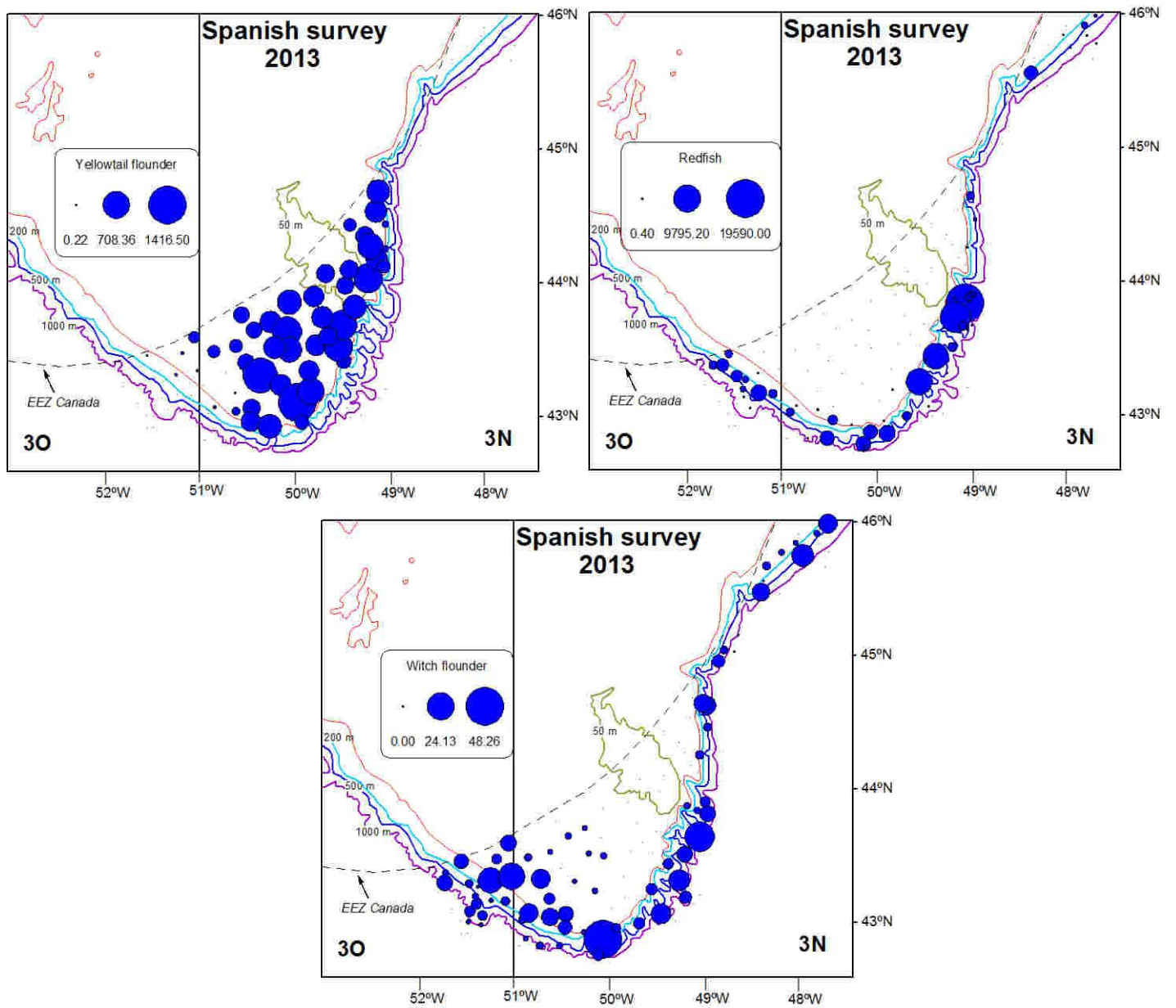


Figure 1.- Position of the hauls and the catch of yellowtail flounder, redfish and witch flounder during the 2013 Spanish 3NO survey. Note that the scale is different in the three graphs.

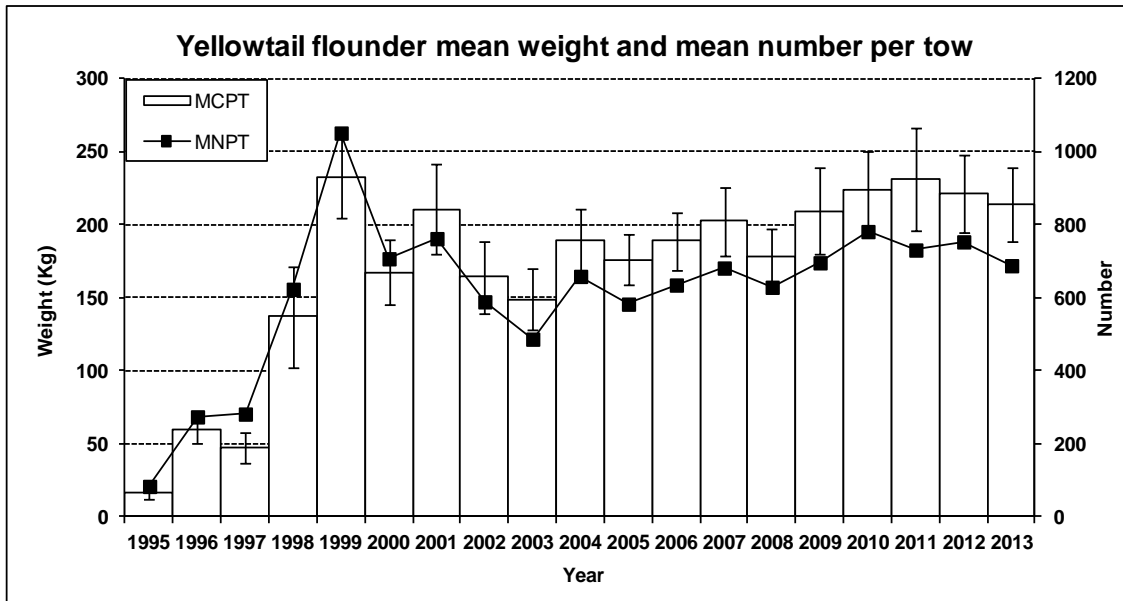


Figure 2.- Yellowtail flounder stratified mean catches in Kg and \pm SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 1995-2013.

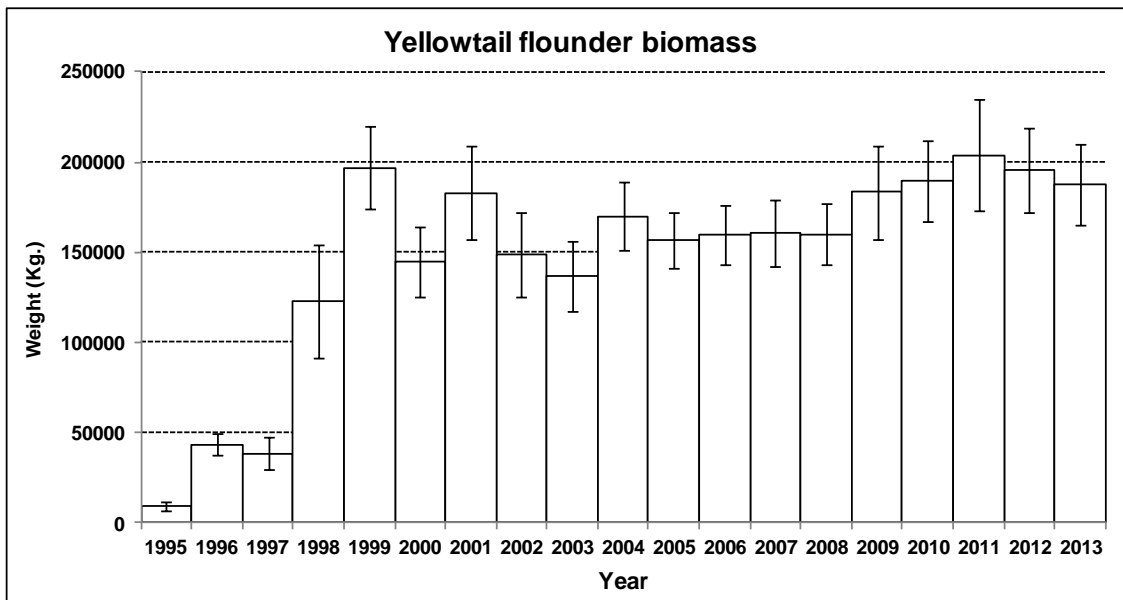


Figure 3.- Yellowtail flounder biomass calculated by the swept area method in tons and \pm SD by year. Spanish Spring surveys in NAFO Div. 3NO: 1995-2013.

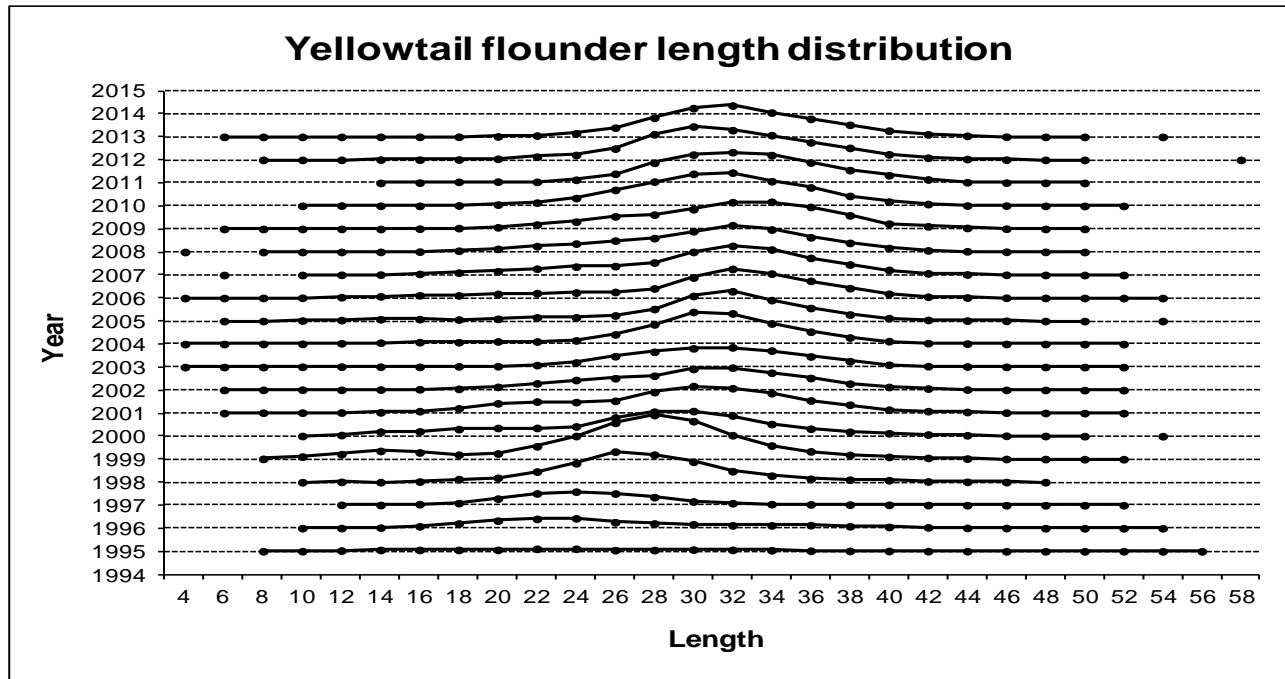


Figure 4.- Yellowtail flounder mean catches per tow length distribution (cm) on NAFO 3NO: 1995-2013. Data from 2009 to 2013 are in Table 8; data for 1995-2008 can be seen in SCR Doc 13/11.

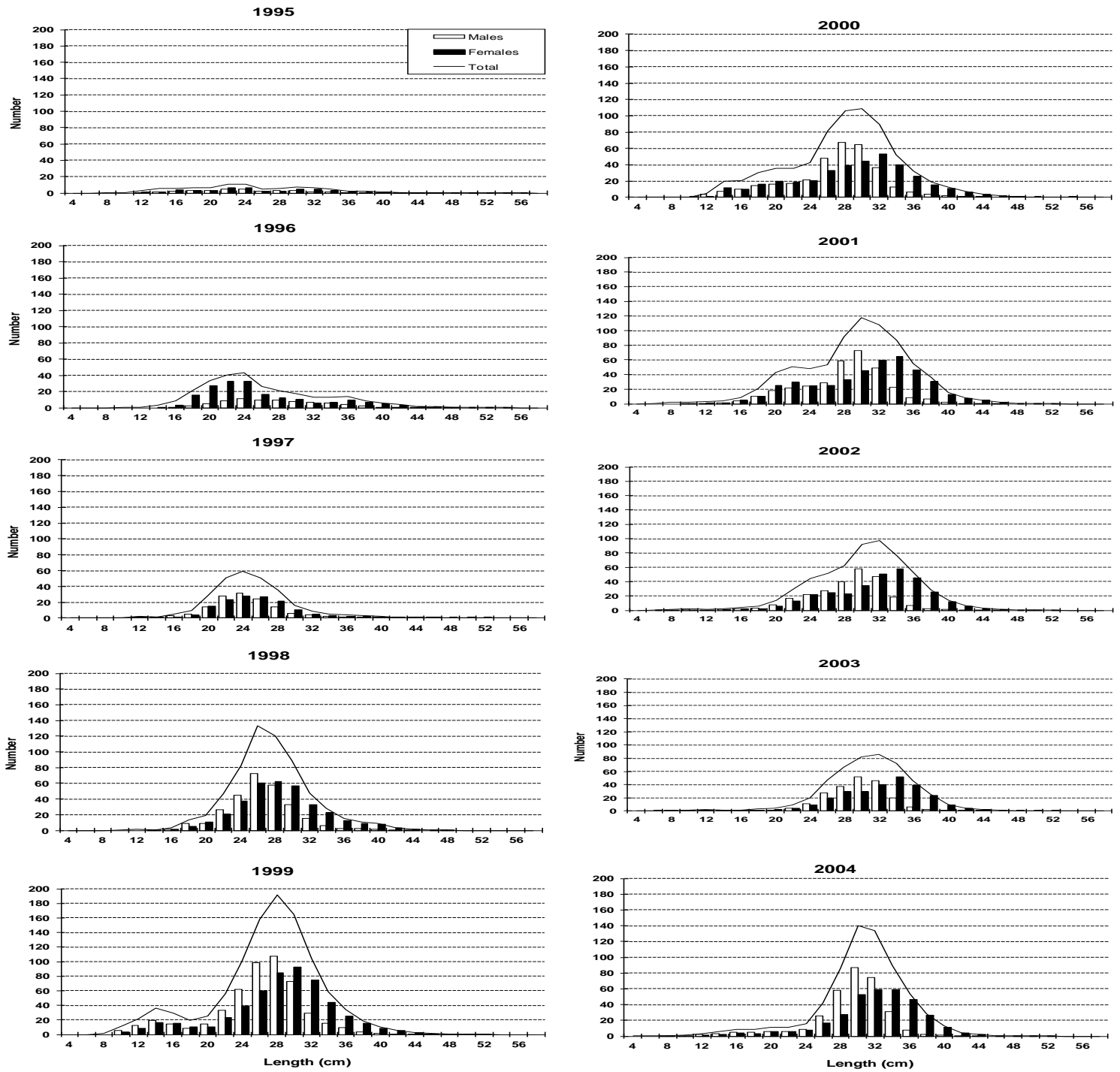


Figure 5.- Yellowtail flounder length distribution (cm) on NAFO 3NO: 1995-2013. Mean catches per tow number. Data from 2009 to 2013 are in Table 8; data for 1995-2008 can be seen in SCR Doc 13/11.

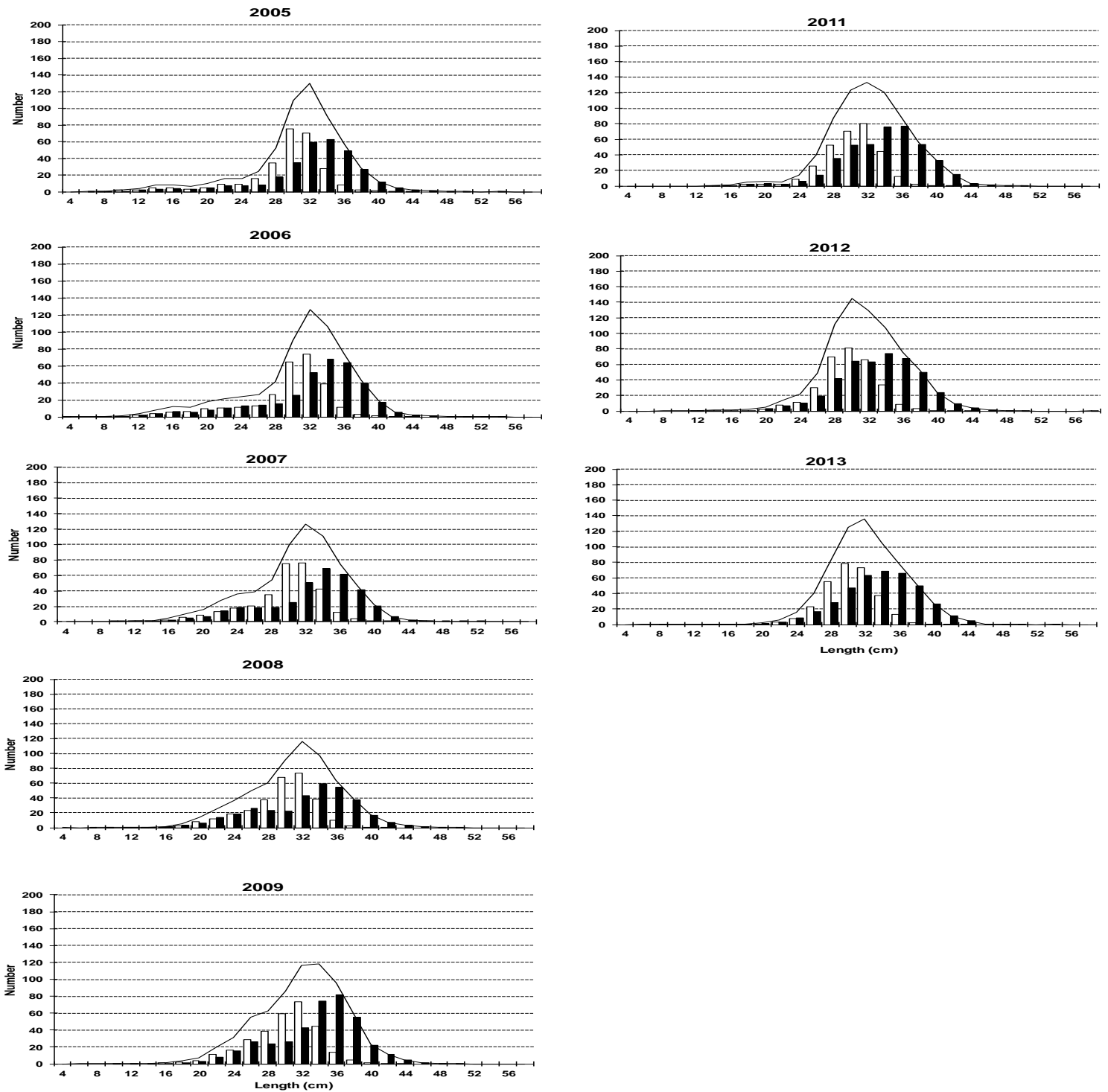


Figure 5 (cont.).- Yellowtail flounder length distribution (cm) on NAFO 3NO: 1995-2013. Mean catches per tow number. Data from 2009 to 2013 are in Table 8; data for 1995-2008 can be seen in SCR Doc 13/11.

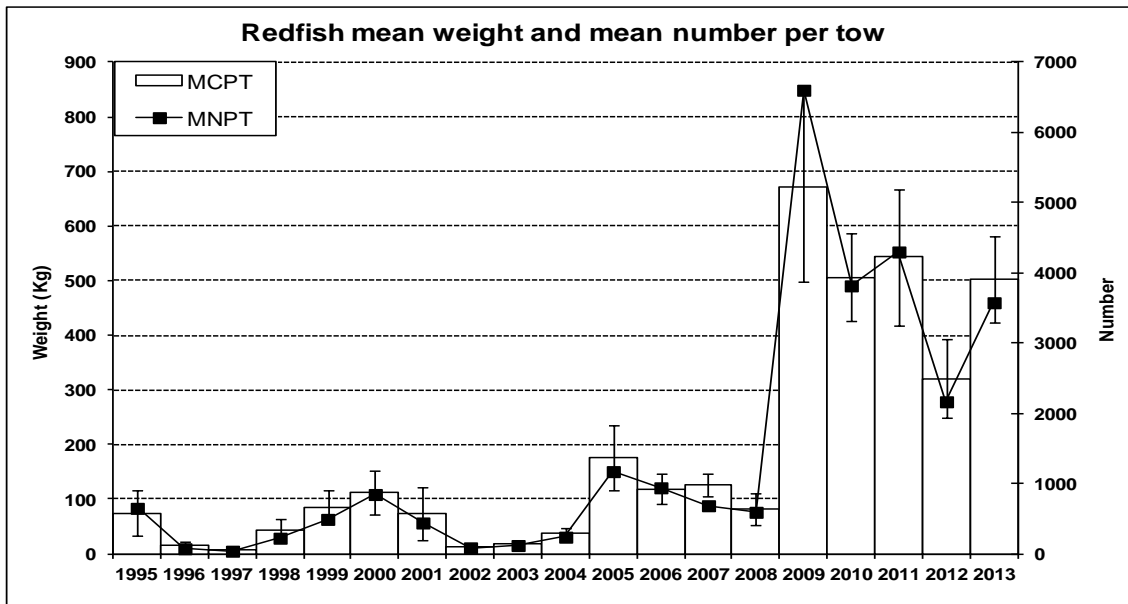


Figure 6.- Redfish stratified mean catches in Kg and \pm SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2013.

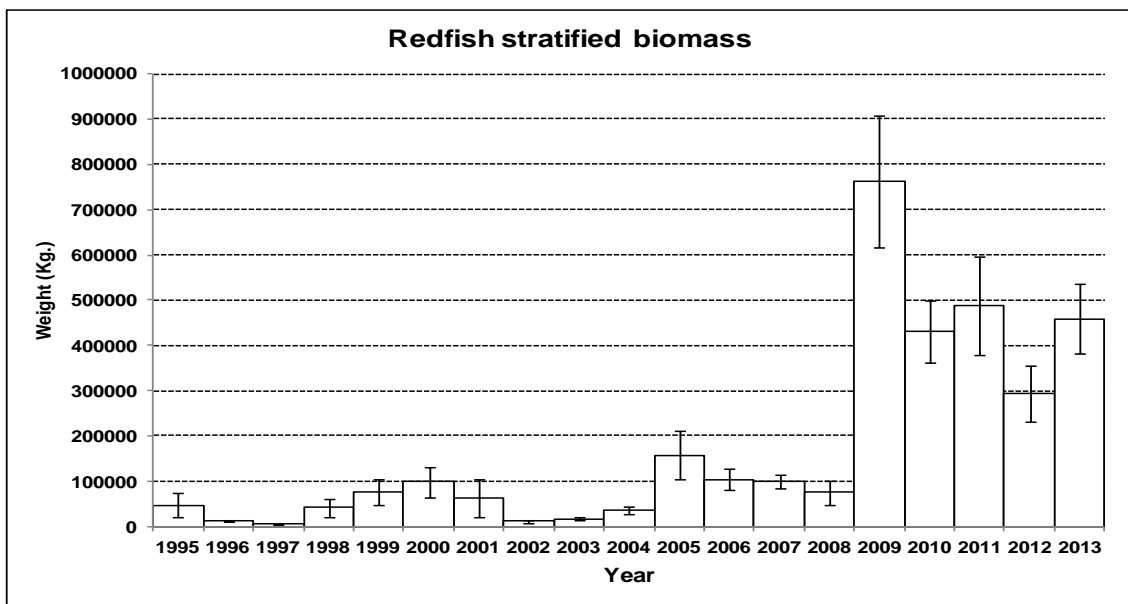


Figure 7.- Redfish biomass calculated by the swept area method in tons and \pm SD by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2013.

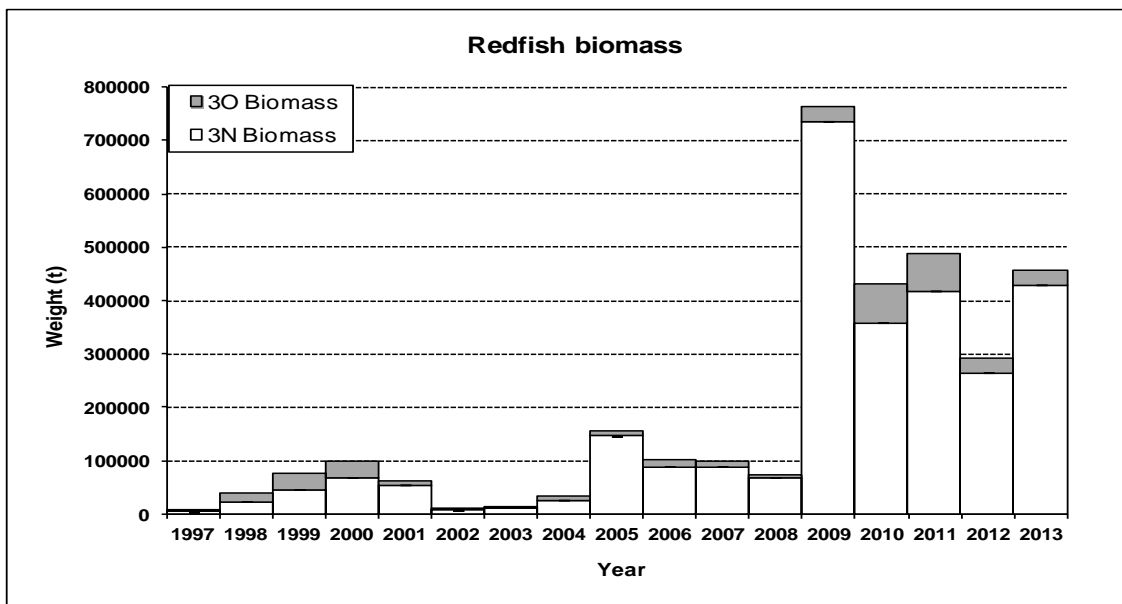


Figure 8.- Redfish biomass calculated by the swept area method in tons by year and Division. Spanish Spring surveys in NAFO Div. 3NO: 1997-2013.

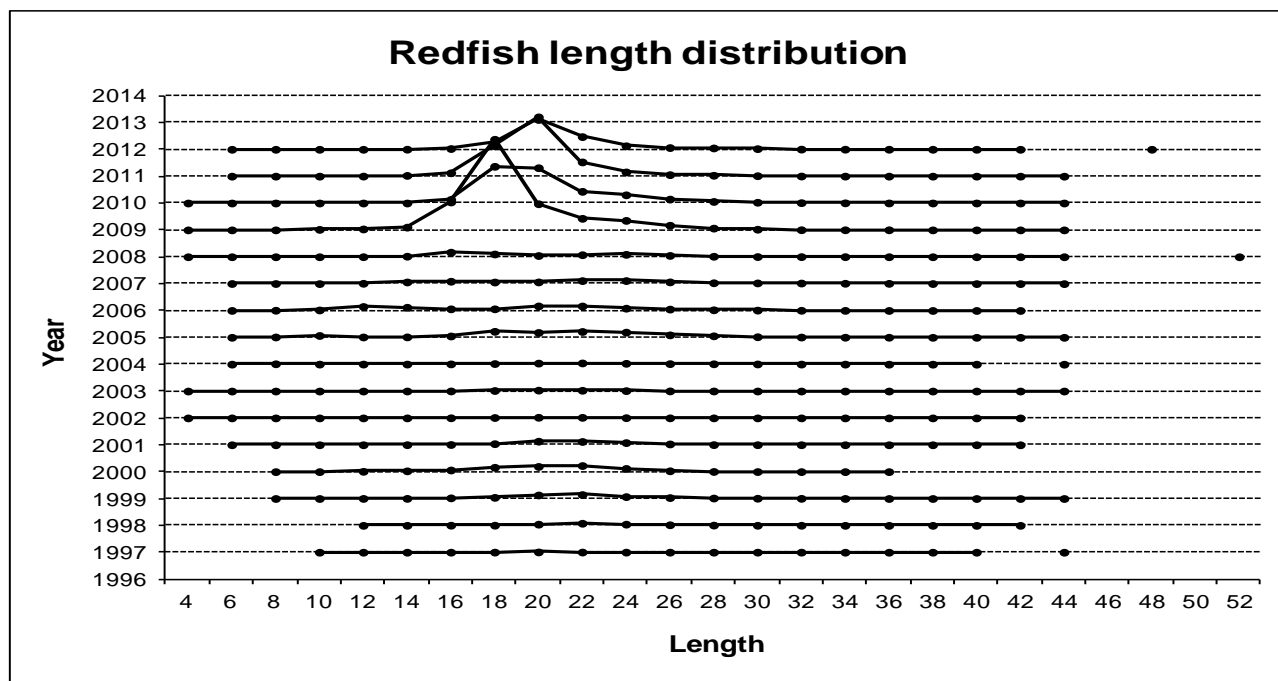


Figure 9.- Redfish mean catches per tow length distribution (cm) on NAFO 3NO: 1997-2013. Data from 2009 to 2013 are in Table 14; the data for 1997-2008 can be seen in SCR Doc 13/11.

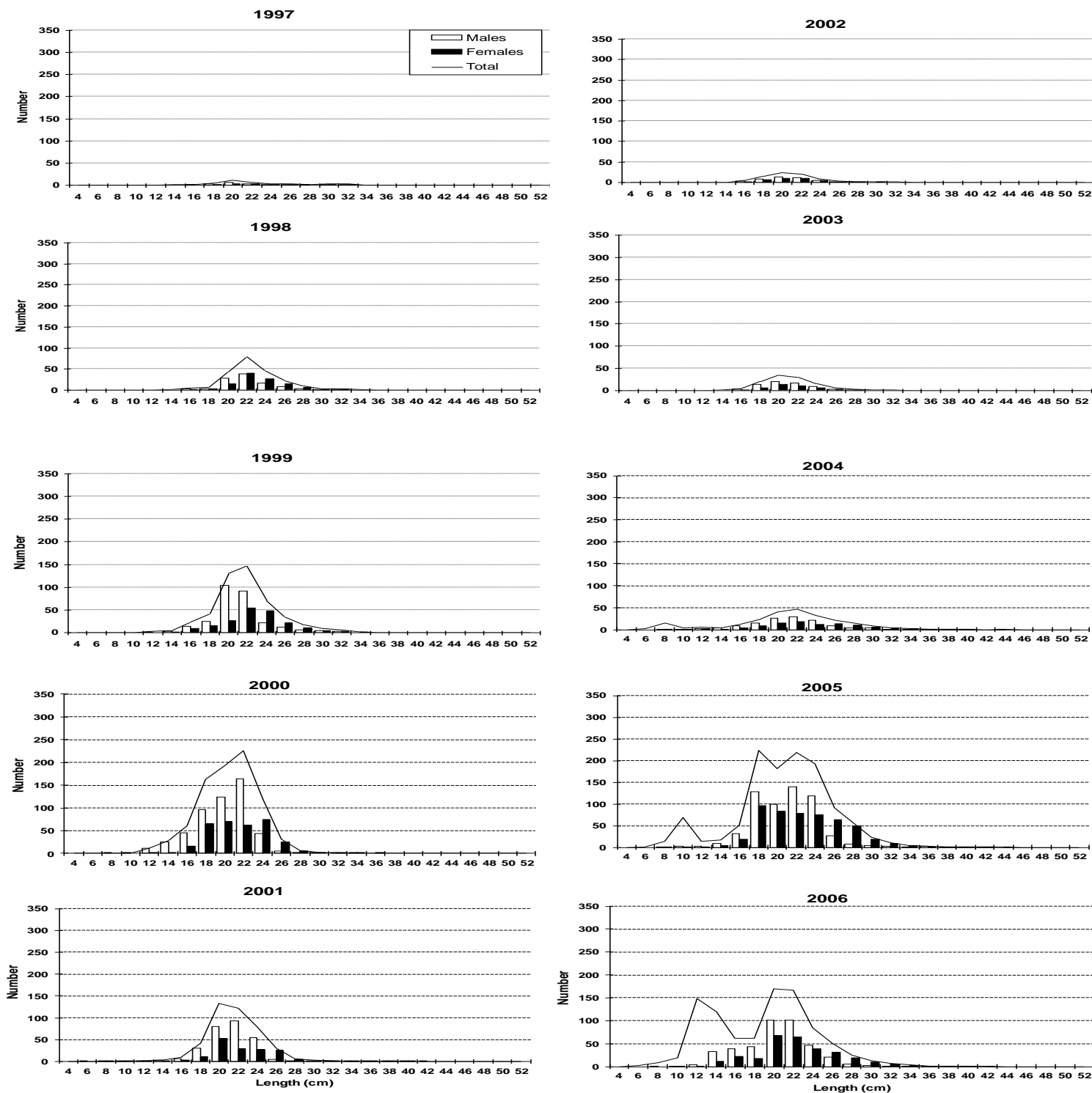


Figure 10.- Redfish length distribution (cm) on NAFO 3NO: 1997-2013. Mean catches per tow number. Data from 2009 to 2013 are in Table 14; the data for 1997-2008 can be seen in SCR Doc 13/11.

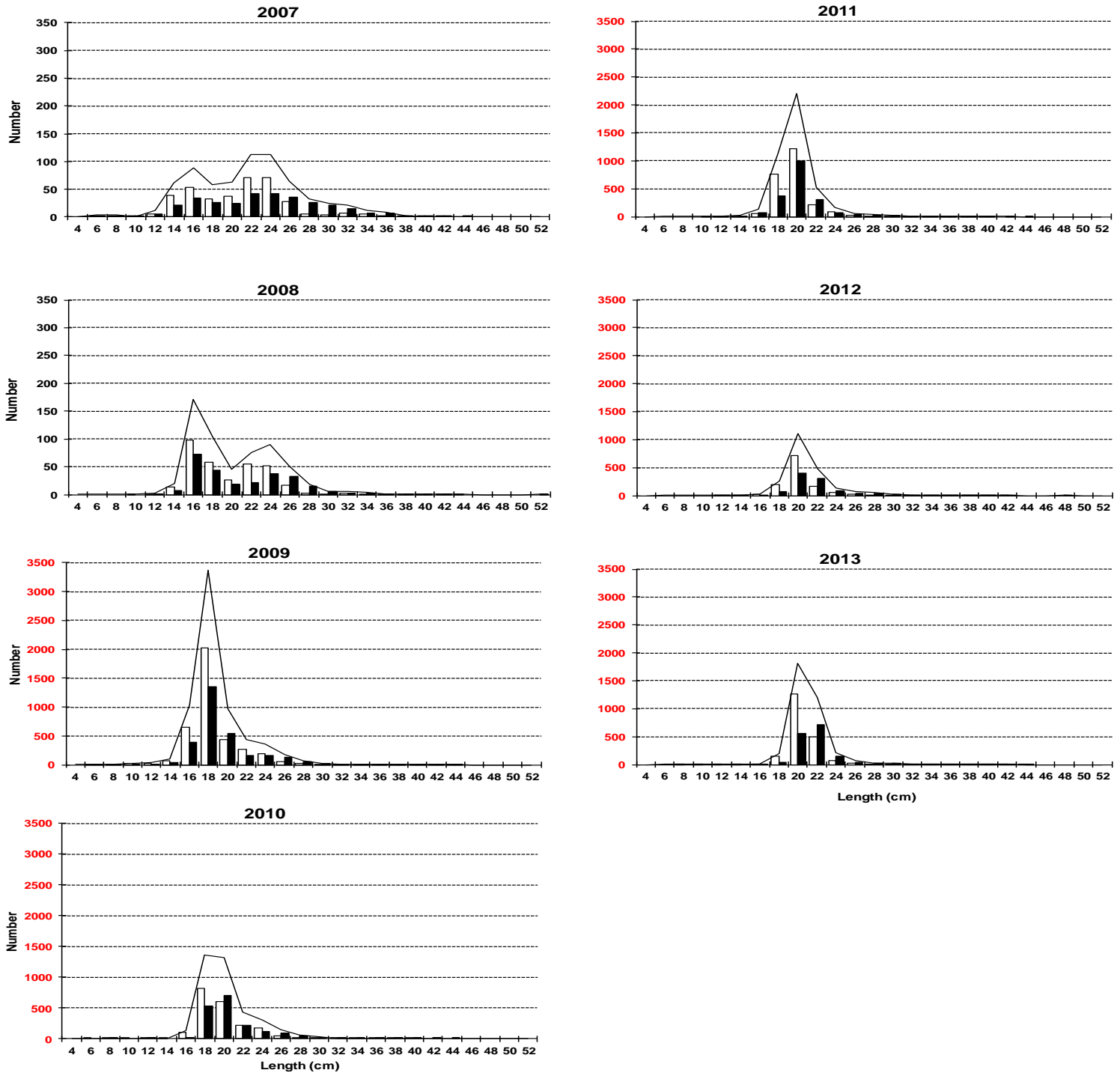


Figure 10 (cont.).- Redfish length distribution (cm) on NAFO 3NO: 1997-2013. Mean catches per tow number. The data from 2009 to 2013 is in Table 8; the data for 1997-2008 can be seen in SCR Doc 13/11. The 2009-2013 graphs have a different y-axis upper limit.

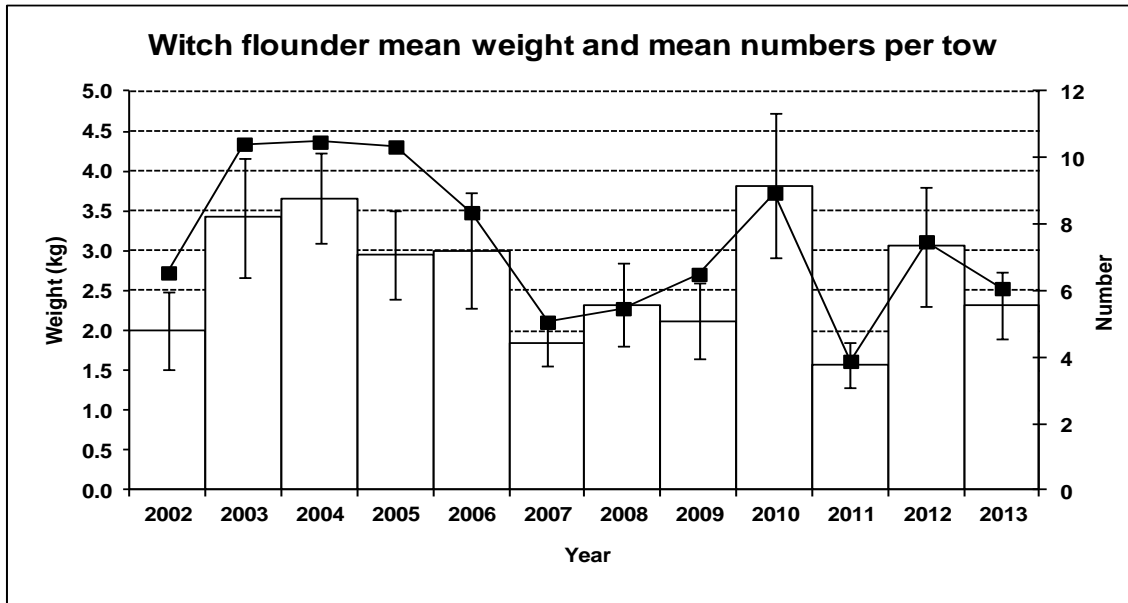


Figure 11.- Witch flounder stratified mean catches in Kg and \pm SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 2002-2013.

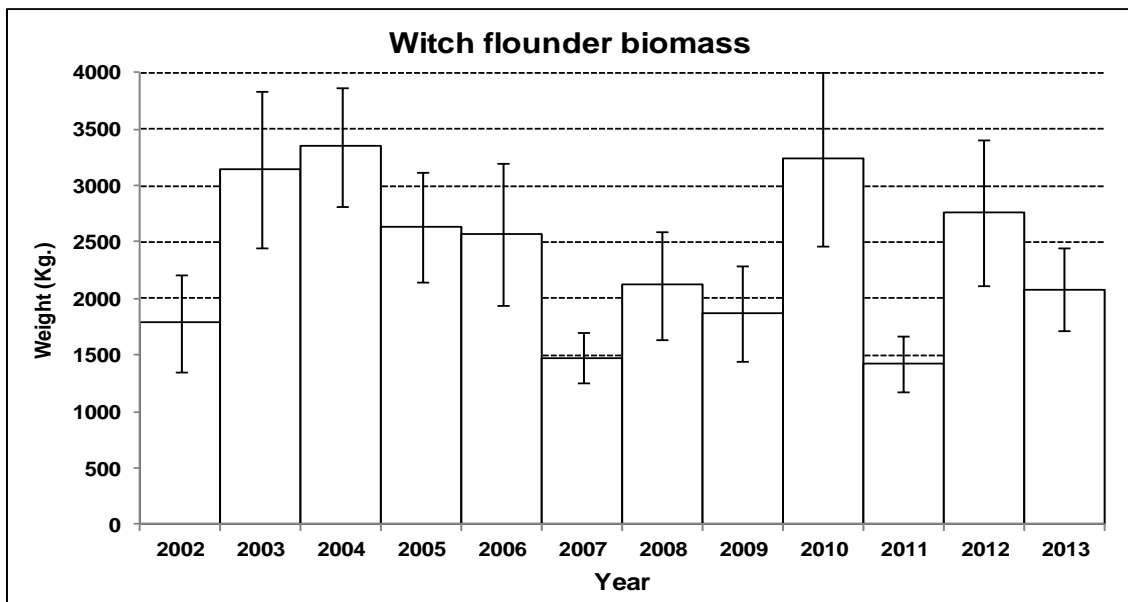


Figure 12.- Witch flounder biomass calculated by the swept area method in tons and \pm SD by year. Spanish Spring surveys in NAFO Div. 3NO: 2002-2013.

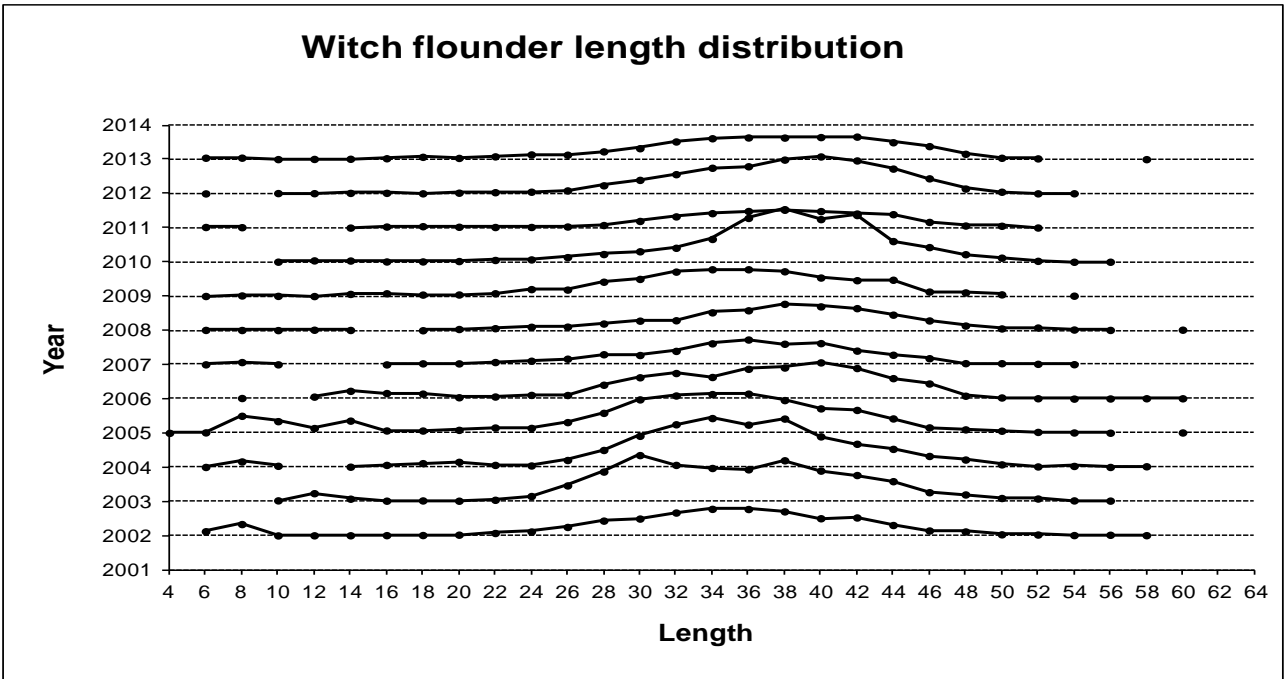


Figure 13.- Witch flounder mean catches per tow length distribution (cm) on NAFO 3NO: 2002-2013. Data from 2009 to 2013 are in Table 20; Data for 1997-2008 can be seen in SCR Doc 13/11.

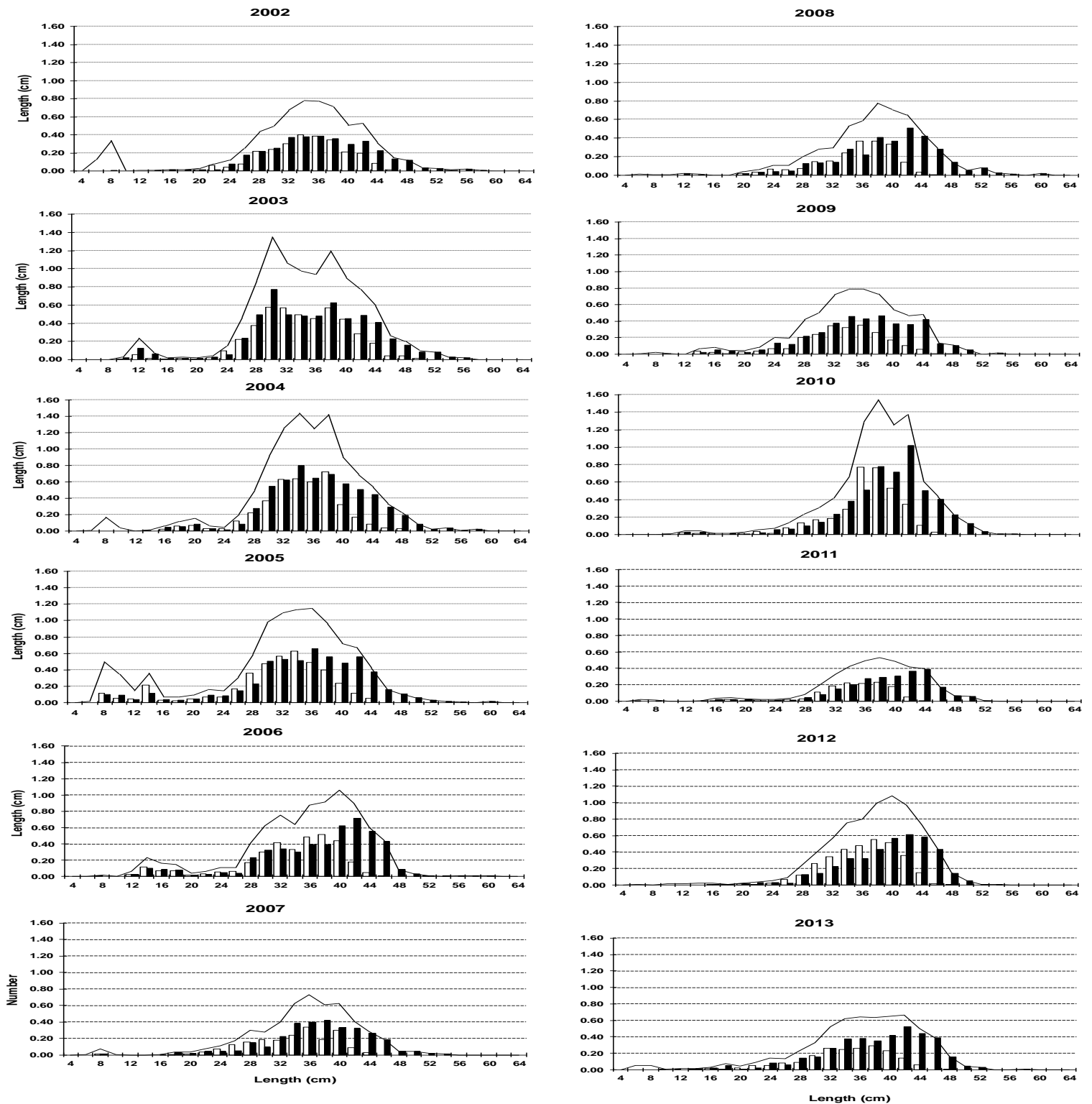


Figure 14.- Witch flounder length distribution (cm) on NAFO 3NO: 2002-2013. Mean catches per tow numbers. Data from 2009 to 2013 are in Table 20; Data for 1997-2008 can be seen in SCR Doc 13/11.